PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :
E04C 2/32, E04B 5/48
F24D 5/10

A1

(11) International Publication Number: WO 91/07557

(43) International Publication Date: 30 May 1991 (30.05.91)

(21) International Application Number: PCT/SE90/00726

(22) International Filing Date: 8 November 1990 (08.11.90)

(30) Priority data:
8903732-9 8 November 1989 (08.11.89) SE
9002941-4 14 September 1990 (14.09.90) SE

(71) Applicant *(for all designated States except US)*: LEGALETT SVENSKA AB [SE/SE]; Box 142, S-446 01 Älvängen (SE).

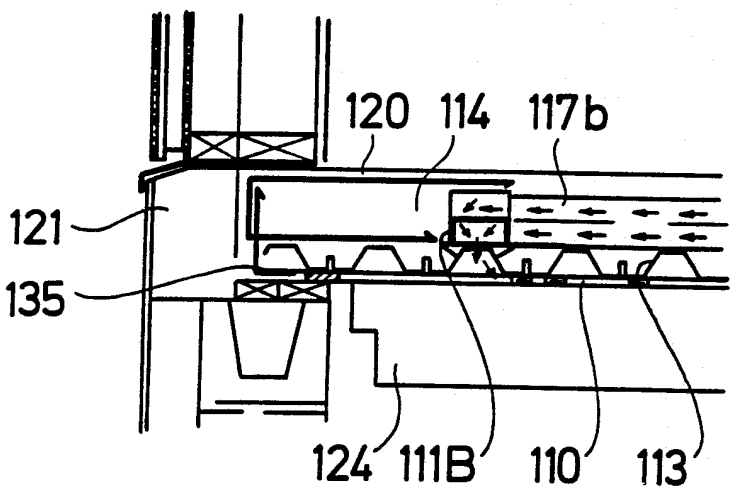
(72) Inventor; and
(75) Inventor/Applicant *(for US only)* : VØLSTAD, Ove, Charles [NO/NO]; Bergenvägen 16, N-4344 Kvernaland (NO).

(74) Agents: STRÖM, Tore, V. et al.; Ström & Gulliksson AB, P.O. Box 4188, S-203 13 Malmö (SE).

(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.

Published
With international search report.
In English translation (filed in Swedish).

(54) Title: FLOW DISTRIBUTION CONDUIT MEANS



(57) Abstract

The invention relates to a flow distributing conduit means, comprising a first and a second sheet (10, 13; 110, 113) being substantially impervious to a flow medium and being arranged in parallel. Said first sheet (10; 110) is a sectional sheet having grooves extending in a first direction, and said second sheet (13; 113) is a sectional sheet having grooves extending in a second direction different from said first direction. Said sheets (10, 113; 110, 113) are rigidly connected to each other in such a way that the grooves of said first sheet (10; 110) connect a plurality of grooves of said second sheet (13; 113), and along the side edges of said sheets are arranged side walls (135; 136) closing at least the grooves of one of said sheets.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**FI**	Finland	**ML**	Mali
AU	Australia	**FR**	France	**MN**	Mongolia
BB	Barbados	**GA**	Gabon	**MR**	Mauritania
BE	Belgium	**GB**	United Kingdom	**MW**	Malawi
BF	Burkina Faso	**GN**	Guinea	**NL**	Netherlands
BG	Bulgaria	**GR**	Greece	**NO**	Norway
BJ	Benin	**HU**	Hungary	**PL**	Poland
BR	Brazil	**IT**	Italy	**RO**	Romania
CA	Canada	**JP**	Japan	**SD**	Sudan
CF	Central African Republic	**KP**	Democratic People's Republic of Korea	**SE**	Sweden
CG	Congo			**SN**	Senegal
CH	Switzerland	**KR**	Republic of Korea	**SU**	Soviet Union
CI	Côte d'Ivoire	**LI**	Liechtenstein	**TD**	Chad
CM	Cameroon	**LK**	Sri Lanka	**TG**	Togo
DE	Germany	**LU**	Luxembourg	**US**	United States of America
DK	Denmark	**MC**	Monaco		
ES	Spain	**MG**	Madagascar		

FLOW DISTRIBUTION CONDUIT MEANS.

The invention relates to a flow distributing conduit means, comprising a first and a second sheet being substantially impervious to a flow medium and being arranged in parallel.

Presently a plurality of constructions are used as intermediate floor structures. In smaller houses the most common intermediate floor structure comprises joist frames provided with building sheets preferably on the underside of the joists as well as on the upper side thereof.

In connection with smaller house also a plurality of other constructional methods exists, for instance cast intermediate floors and different types of pre-fabricated intermediate floors provided with constructional elements made of light concrete or ordinary concrete.

In larger buildings normally intermediate floors made of concrete cast in situ or pre-fabricated concrete elements, for instance elements made of light concrete are utilized. Light wooden constructions are used only in exeptional cases in larger buildings.

Lately a comparatively new type of pre-fabricated die elements have been introduced on the market. This is a type of large elements having a die ready for casting and having also an integrated framework made of reinforcement bars. After mounting said elements and after all installations made on the upperside of said elements the casting of concrete prepared. Such a system has several advantages, for instance a fast mounting, a low constructional height, a possibility for simple installations within said element before the concrete casting, a small amount of extra reinforcement etc.

A problem in most of the pre-fabricated element systems on the market today, with few exceptions, is that the weight thereof is very large, they are small sized

(width and length), the required mounting is expensive and time consuming and the costs for transporting are very high. As a consequence the building time is substantially extended which increases the building interest costs. In the types of constructions mentioned above for intermediate floor structures said floor structure has no other function than dividing the building into floor plans. Howeever, constructions of intermediate floors exist which comprise some kind of heating device. Said heating device normally comprises electric heating coils, but also coils of piping for hot water, which are arranged in other parts of said intermediate floor, exist. There are also heating devices for intermediate floors in which water is circulated and which are arranged on top of the intermediate floor.

Common to all the heating devices mentioned above is that they provide local heating and thereby any desired comfort in certain areas, such as bathrooms and toilets. To achieve an efficient heating high temperatures are required in the heating device. Normal temperatures are from 30 - 40^{o}. However, common to them are also drawbacks, such as being expensive and requiring large demands for labour during installation, but most important, they are not reliable during longer time intervals. For instance may electrically heating coils be short circuited when driving a nail into the floor. Similar problems are present also in water carried heating devices in which water tubes can be punctured by a nail. Additionally there is a risk which is not negligable for water leakage as a result of settings in the house and as a result of fatigue by aging.

In larger building, mainly in multiple-unit dwelling houses, problems with a very poor sound reduction between floor plans are noticed, especially if "simple" constructions are used.

A floor element using air for heating is disclosed in NO-B-150 736. The intermediate floor structure according to said document comprises a plurality of elements arranged in contact with each other, each element comprising an upper ceiling sheet, a lower ceiling sheet and a plurality of spreaders arranged therebetween. Between said spreaders channels are formed through which heated air is fed. According to said document the floor element is arranged on a floor structure so as to form together therewith a self-supporting intermediate floor structure. The floor according to said patent should have a low temperature coefficient, so as to make possible a fast change in temperature locally in different areas in said building.

An object of the present invention is to substantially overcome the problems mentioned above and also to make possible a fast and comparatively simple assembly of a very rigid and sound-reducing intermediate floor structure. The intermediate floor structure according to the invention is also cheap and has outer dimensions corresponding to intermediate floor structures common at present. According to the invention there is accomplished also a control of the conditions in dwelling areas by a "soft" heat emission to said areas. Furthermore, the time required for the drying-out of concrete in a floor structure is substantially reduced.

Another object of the present invention is to substantially eliminate the drawbacks of heavy element systems which are also difficult to mount. At the same time all positive properties of pre-fabricated die elements described above remain with the invention. Furthermore, there are other completing advantages when using the invention.

The intermediate floor structure according to the invention makes possible also a dividing of dwelling areas

into a plurality of zones, normally consisting of rooms, in which the heating is individually controlled.

The objects mentioned above are accomplished by the invention having the features of claim 1 and 2.

The invention will be described in more detail by means of an embodiment with reference to the accompanying drawings, in which

FIG. 1 is a cross-sectional view of an intermediate floor structure according to the invention,

FIG. 2 is a cross-sectional view of an intermediate floor structure according to the invention, said view being in right angle to the section of FIG. 1,

FIG. 3 is a cross-sectional view corresponding to FIG. 2,

FIG. 4a-c is a cross-sectional view and two front views of a heating device,

FIG. 5 is a cross-sectional view according to FIG. 2, said view showing the connection of said intermediate floor structure on a wall,

FIG. 6 is a top view of a floor divided into zones,

FIG. 7 is a perspective view of a conduit means according to the invention,

FIG. 8 shows schematically the flow to and from a conduit means accordong to the invention,

FIG. 9 shows an application with a conduit means according to the invention,

FIG. 10 is a cross-sectional view of a part shown in FIG. 9, and

FIG. 11 is across-sectional view of the part of FIG. 10, said view being in right angle to the section of FIG. 10.

The intermediate floor structure shown in FIG. 1 comprises as a supporting part a corrugated sheet 10, for instance shaped as a "TRP-profile" made of steel or alumi-

num. The profile is dimensioned for each building. On top of said first profile 10 a second corrugated sheet 13 is arranged in right angle to said first profile, said second sheet 13 functioning as a distributing profile for incoming heated air and for outgoing cooled air. In a groove of said profile 10 a conduit 11 is arranged for the supply of air. The conduit 11 is connected through a restriction sheet 12 to grooves extending in the transverse direction of the conduit 11 and being defined by said sheet 13 in the upper side. The function of said restriction sheet 12 is described in more detail with reference to FIG. 6. Said sheet 13 is suitably fixedly connected to said sheet 10, for instance by a screw joint. On top of said sheet 13 a heat accumulating layer 14 is arranged, said layer consisting in the shown embodiment of concrete and conventionally arranged reinforcement bars 20. Said layer 14 can also consist of gypsum or other materials having heat accumulating properties, such as different types of building sheets. Said layer 14 has only in exceptional cases a minor supporting function making the choice of material free. On top of said heat accumulating layer 14 is provided a coating 16 made of some kind of conventional floor material having a suitable specific heat transfer. A sheet 23 made of sound reducing material, such as rubber, is arranged in contact with the underside of said profile 10. Below said sheet 23 is in the shown embodiment arranged a conventional insulating layer 15 and below said insulating layer a sheet 24 made of gypsum. In applications where a heat transfer downwardly is desired said insulating layer 15 is excluded and some kind of false ceiling sheet is arranged in contact with said sheet 23 or directly in contact with said sheet 10. Instead of said restriction sheet 12 a tube having apertures in the upper side thereof can be arranged in the groove formed in said profile 10.

From FIG. 2 it is more clear how said profile 13 is formed and how said restriction sheet 12 separates the space in the grooves of said profile 10 from the space in the grooves below said profile 13. In said restriction sheet 12 apertures 25 and 26 are formed, said apertures having an increasing diameter from a connection piece 27 through which heated air is supplied from a conduit 17a. The intermediate floor structure comprises also a number of joist frames 18, on which said sound reducing sheet 23 are attached by gluing or in another suitable way.

With reference to FIG. 3 it is clear that the intermediate floor structure according to the invention comprises three ducts 17a, 17b, 17c, through which heated air is supplied to the intermediate floor structure in a method further disclosed below with reference to FIG. 6.

For the heating of air to be fed into the intermediate floor structure a heating means 19 is arranged on the other side of said intermediate floor structure. Preferably said heating means 19 is arranged centrally in the house, so as to minimize heat and flow losses in said ducts 17a-c. In other not shown embodiments said heating means is replaced by several smaller units disposed so as to facilitate an individual control of parts of the floor structure. Said heating means 19 comprises in the shown embodiment an electric battery 19a, but it is possible to provide in said heating means a water heater having the desired power and also to provide said heating means with a heat exchanger which is connected to a heat pump, so as to achieve a further decrease in heat losses in the building. Said heating means comprises also a fan 19b and is provided with a plurality of outputs 19c for blowing out heated air, and a number of inlets 19d through which air is drawn. Said outputs 19c of said heating means are connected to said ducts 17a-17c, from which heated air is fed into the

intermediate floor structure according to a method described below. The inputs 19d of said heating means is in the shown embodiment connected to the space within the grooves below said sheet 13 for return suction of air which has emitted heat to said heat accumulating layer 14.

FIG. 5 shows a part of a intermediate floor structure in a cross-sectional view similar to FIG. 2 and from said figure it is clear how the intermediate floor structure is connected to an outer wall. On top of a lower wall 28, shown as a basement outer wall in the embodiment, is arranged a horizontal edge beam 22 made of plywood. Vertically on said edge beam 22 is arranged a similar edge beam 21, in which said profile 10 is attached. On top of the intermediate floor structure is arranged an upper outer wall 29 covered by a facade layer 30. Such a construction is very well suited when assembling said intermediate floor structure on site. When assembling, the underlaying outer wall 28 is constructed firstly and said horizontal edge beam 22 is attached thereto. Secondly sections of said sheet 10 available in lengths corresponding to the width of said building, are put out. Several sections of said sheets 10 are arranged side by side with some conventional overlapping. Outside of said sheets 10 are provided vertical edge beams 21 to which said shets 10 are attached. The building has now very rapidly been provided with a floor structure withstanding walking on and lowering to a high extent the risks for the installer of said intermediate floor structure when continuing the installation efforts. Sheets 13 are arranged on top of said sheets 10, the grooves of said sheets 10 crossing grooves of said sheets 13. Said sheets 13 constitute together with said vertical edge beams 21 a casting mould when casting said heat accumulating concrete layer 14. Said sheets 13 also form a bottom reinforcement for said concrete layer decreasing

substantially the reinforcement of said layer as compared to conventional concrete floor structures. In some loading circumstances it is even possible to exclude reinforcement of said concrete layer 14.

With reference to FIG. 6 the heating up and controlling of conditions in dwelling spaces above said intermediate floor structure will be described in more detail. Air is heated in said heating device 19 and is fed through not shown pipings to said ducts 17a, 17b, 17c, through which air is fed into said intermediate floor structure. In appropriate positions along the length of said ducts 17a-17c said connection pieces 27 are arranged for discharging air into said conduits 11, which are covered by said restriction sheets 12. Air fed through said duct 17c is discharged in a first connection piece 27c from which it is fed through conduits 11 and through said restriction sheet further to spaces below said sheet 13. Some of the heat of the air is transferred to said heat accumulating layer 14 during the flow of air through grooves of said sheet 13. The air flow is then collected in conduits 11 through a restriction sheet 12d. The area below which said air has flown belongs to a first zone C, D, the heatsupply thereto thus being determed by the air supplied through said conduit 27c and said restriction sheet 12c. In the same way air is supplied a connection piece 27a through said duct 17a from which air is supplied to a second zone A of said intermediate floor structure through a conduit 11 and a restriction sheet 12a. By such a zone distribution of the heated are there is accomplished an individual control of temperature in separate parts of dwelling areas. For instance a restriction of flow of heated air to a zone below a bedroom can be accomplished by control means arranged in a connection piece 27 or in said restriction sheet 12.

Said restriction sheet 12 functions also as a distributor for the heated air along one side of each zone so as to provide the desired distribution of air below the sheet 13 accomplishing also a control of emission and reception, respectively, of heat. In an alternative embodiment said restriction sheet 12 comprises one fixed section, which is provided with apertures for letting out air, and one movable section which is slidable by a control in each end. By means of said movable section supplied air is distributed either linearly along the complete restriction sheet or is the distribution of air made along a distributing conduit. Control of air supply is possible before, during and after the process of building.

In the embodiment shown in the figures air is cirkulated in a closed system. However, according to the invention it is possible also to arrange an inlet of pre-heated fresh air which is supplied to dwelling spaces as ventilation air after being fed through said intermediate floor structure.

In an alternative embodiment according to the invention no connection pieces 27 are arranged but instead apertures are made in the bottommost section of said profile 10 just in front of said dict 17. By supplying a covering layer below said profile 10 it is also possible to use the groove of said profile 10, which is open at the bottom, as a conduit 11, apertures corresponding to apertures in said restriction sheet 12 being made in the upper closed section of the profile 10, and apertures also being made in the underlaying layer in front of said duct 17 for the supply of heated air.

The invention is applicable also during such temperature conditions when cooling is desired. In such applications said heating device is replaced by or combined with a cooling device.

In the embodiment shown in FIG. 7 the flow distributing conduit means according to the present invention comprises two sheets 113 and 110 arranged in parallel. Each of said sheets are made of a material substantially impervious to a flow medium. In the shown embodiment the sheets are made of corrugated sheet metal which is a very suitable material. The sheets have grooves extending in the longitudinal direction and the sheets are arranged on top of each other in such a way that said grooves form a right angle. Each groove of one of the sheets thereby provides a connection between the grooves of the second sheet, and a flow medium fed through said conduit means can moove freely and be distributed in said conduit means. Two sheets are put to overlap each other so as to achieve the required continuity when mounting the elements. By fixedly connecting said sheets a rigid unit is provided which is self-supporting and which can be used in different applications. The sheets 113 and 110 can be connected by using for instance self-driving screws, rivets, spot welding, gluing etc.

In the embodiment described above the conduit means is applicable in a variaty of application areas, such as heat exchangers, heating elements and the like. Common to different applications is that high distributing ability and large area towards the environment of the conduit means is used. If the conduit means is intended for use in an intermediate floor structure it is suitably provided with insulating and/or a complete false ceiling.

From FIG. 8 it is clear how a flow medium, for instance air, is supplied to and circulates in a rectangular conduit means according to the invention. Along side edges of said conduit means walls connecting said sheets have been arranged to prevent the medium from leeving the conduit means. Two inlet ducts 117a and 117b convey said

medium from a pump and heating means 119 to conduits 111a and 111b which are provided along to adjacent side edges of the conduit means. Said conduits 111a and 111b are connected with one of the grooves of said first sheet 113 (see also FIG. 11) by apertures distributed along the longitudinal direction. A flow medium is introduced in said conduit 111a and 111b through inlet ducts 117a and 117b under pressure. From said ducts said medium enters a first groove of said first sheet and therefrom it is distributed through the conduit means emitting heat to or receiving heat from said conduit means. Through outlet openings of the lower pressure side of said pump means said medium leaves the conduit means and is drawn into said pump means, thereby closing a circulating process.

In the application according to the invention shown in FIG. 9 a conduit means according to the invention is used in an intermediate floor structure. From a centrally disposed pump means 119 air is driven into conduits 111a and 111b through inlet ducts 117a and 117b and further into said conduit means. The air then returns to the low pressure side of said pump means through the conduit means during heat emission to other parts of the intermediate floor structure.

FIG. 10 and 11 show in more detail the construction of an intermediate floor structure in a building when utilizing the conduit means according to the invention. Two pre-assembled sheets 113 and 110 are put on walls thereby forming a floor layer which can be stepped upon during the building process. On top of the upper sheet 113 inlet ducts117a and 117b are arranged, said ducts being connected to conduits 111a and 111b arranged along the outer walls of said building. Set inlet ducts 117a and 117b are insulated so as to decreas heat losses during the conveyance towards said conduits 111a and 111b. The upper corrugation, i.e.

the sheet 113, is designed to constitute a bottom reinforcement for a concrete layer 114 which is cast on top of said sheet 113 when an edge element 121 is disposed outside said conduit means along the outer walls of said building. Said edge elements 121 and said conduit means thereby constitute the mould when casting. Thus, in this embodiment the inlet ducts 117a, 117b are arranged in the concrete layer 114. Said conduits 111a and 111b are connected directly to the grooves of said upper sheet 113 to which the air is transferred and then distributed in the entire conduit means. To prevent leakage of the flow medium from the conduit means walls shaped as beams 135 and 136 are arranged in the end parts of said grooves so as to close said grooves. A conventional false ceiling 124 is arranged below said lower sheet 113. Also other structures of false ceilings made especially for the conduit means are used in certain applications. Reinforcement bars 120 are embedded in said concrete layer 114. However, less reinforcement than in a conventional concrete slab is required thanks to the bottom reinforcement.

It is appropriate to use the conduit means according to the invention as a rigid and very compressed element for an intermediate floor structure, the thickness thereof being as low as 75 mm. It is possible to produce large elements, dimensions thereof being at least 2250x12000 mm. The dead weight is as low as 15 kg per m^2. As a result of large elements the mounting of the elements on side is very fast. Elements compressed with regard to heights combined with low weight make transporting more effective with regard to volume as well as to casts. In practice this means, that up to 1200 m^2 of elements can be conveyed on a truck with a trailer. The normal quantity in transport for other types of intermediate floor structure elements is

from 1130 to 150 m^2 on a corresponding truck and trailer. The difference depends both on the weight and the volume.

In a structural sence the construction gives a combined effect in that the upper corrugated shet function both as a remaining mould and as a bottom reinforcement. Furthermore, it is possible to make installations of tubes and other types of technical installations in a conventional way either on the upper side of the system of elements before casting or on the underside of the system of elements after casting. Besides the advantages with the system of elements described above two unique advantageous characterize the invention.

It is favourable to transport air/gas in all directions in the sheets because the element system comprises corrugated sheets which are layed crosswise. A practical benefit and use of this fact can for instance be to convey heated or cooled air between said sheets and obtain control of conditions in the dwelling space above the intermediate floor structure. Another essential advantage is that it is very easy to install electrical installation tubes and fresh water pipelines in conduits extending in the longitudinal direction and the transverse direction, respectively, which are formed between the two corrugated sheets. In practice this means that technical installations can be made above, under and within the intermediate floor structure element.

If the choice is not to use any kind of insulation or other type of false ceiling the conduit means by itself can function as a complete false ceiling by being painted/surface conditioned at delivery.

The invention is not limited in utilizing a certain type of corrugated sheets 113 and 110. The reason for this is that a plurality of corrugated sheets 113 are available at the market and have a combined effect in accordance with

the description. There is also a large number of variants of corrugated sheet 110.

CLAIMS

1. Flow distributing conduit means, comprising a first and a second sheet (10,13;110,113), being substantially impervious to a flow medium and being arranged in parallel, c h a r a c t e r i s e d in that said first sheet (10;110) is a sectional sheet having grooves extending in a first direction, that said second sheet (13;113) is a sectional sheet having grooves extending in a second direction different from said first direction, that said sheets (10,13;110,113) are fixedly connected to each other in such a way that said grooves of said first sheet (113) connect a plurality of grooves of said second sheet (110), and that along side edges of said sheets are arranged sidewalls (135;136) closing at least the grooves of one of said sheets.

2. Flow distributing conduit means according to claim 1, c h a r a c t e r i s e d in that said first direction is in right angle to said second direction.

3. Flow distributing conduit means according to claim 1 or 2, c h a r a c t e r i s e d in that duct means (17;117a,117b) are arranged for conveying said flow medium to distributing means (11;111a,111b) which are connected at least to the grooves of one of said sheets, and that means (19;119) are arranged for supplying said flow medium to said duct means (17;117a,117b) and for evacuating said flow medium when said medium has passed said conduit means.

4. Device for controlling conditions of dwelling spaces above an intermediate floor structure comprising a conduit means according to claim 1, c h a r a c t e r i s e d in that a heat accumulating layer (14) is arranged in heat conducting contact with one of said sheets (10,13;110,113).

5. Device according to claim 3, c h a r a c t e r i s e d in that said distributing means (11) is constituted by a

groove of said first sheet (10;110) and that along said distributing means (11) and between said distributing means (11) and the grooves of said second sheet is arranged a restriction means (12) having a varying restriction effect in the longitudinal direction of said distributing means.

6. Device according to claim 4, c h a r a c t e r i s e d in that on top of said heat accumulating layer (14) is provided a coating (16) for a controlled heat emission therefrom and that on the underside of said conduit means is provided a coating in form of a heat insulating layer (15).

7. Device according to any of claim 4-6, c h a r a c - t e r i s e d in that said duct means (17;117a,117b) is arranged in said heat accumulating layer (14).

8. Device aaccording to any of claim 4-6, c h a r a c - t e r i s e d in that said duct means (17;117a,117b) is arranged on the side of said conduit means opposite to said heat accumulating layer (14).

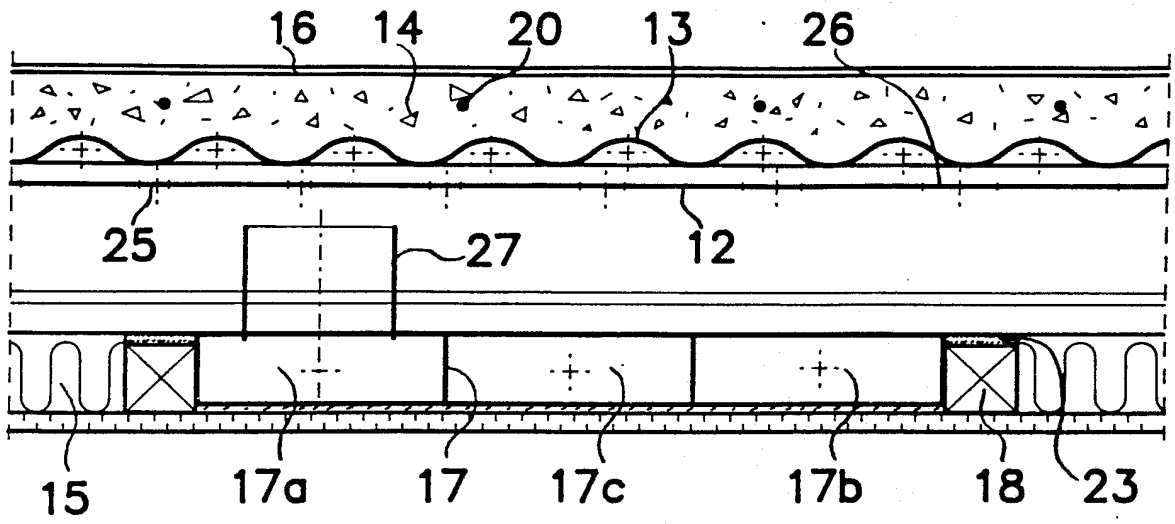

16
14
20
13
26
25
27
12
15
17a
17
17c
17b
18
23

FIG 2

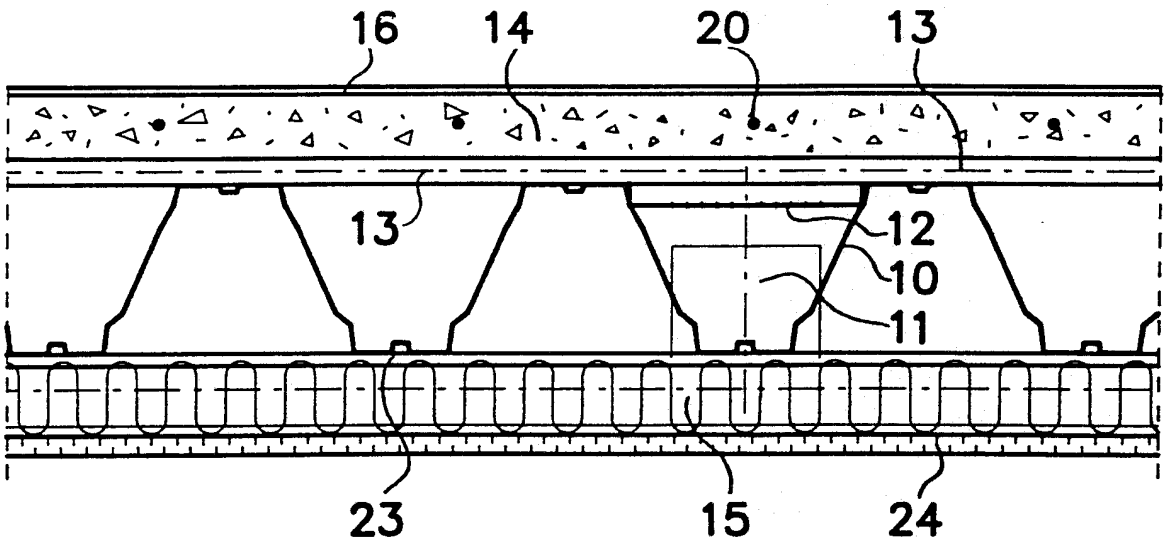

16
14
20
13
13
12
10
11
23
15
24

FIG 1

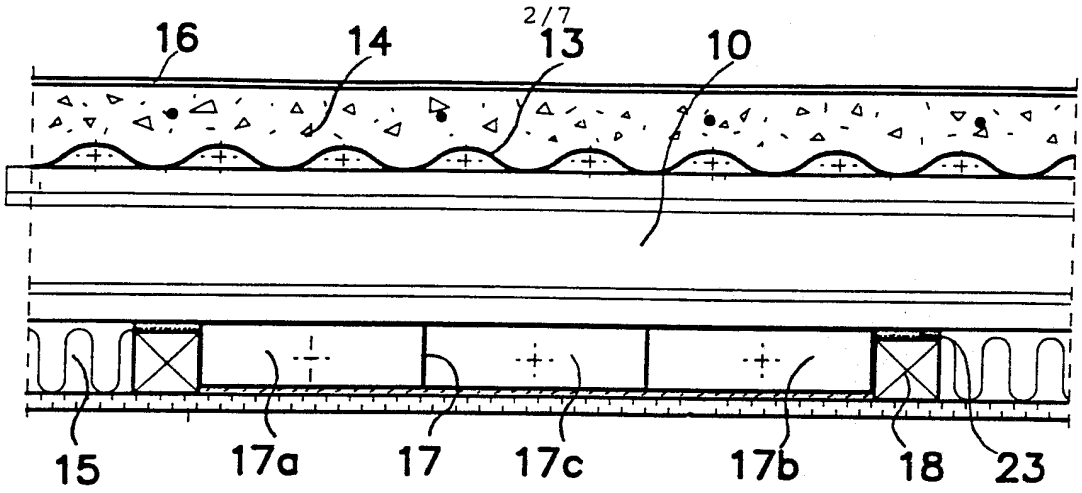

16
14
13
10
15
17a
17
17c
17b
18
23

FIG 3

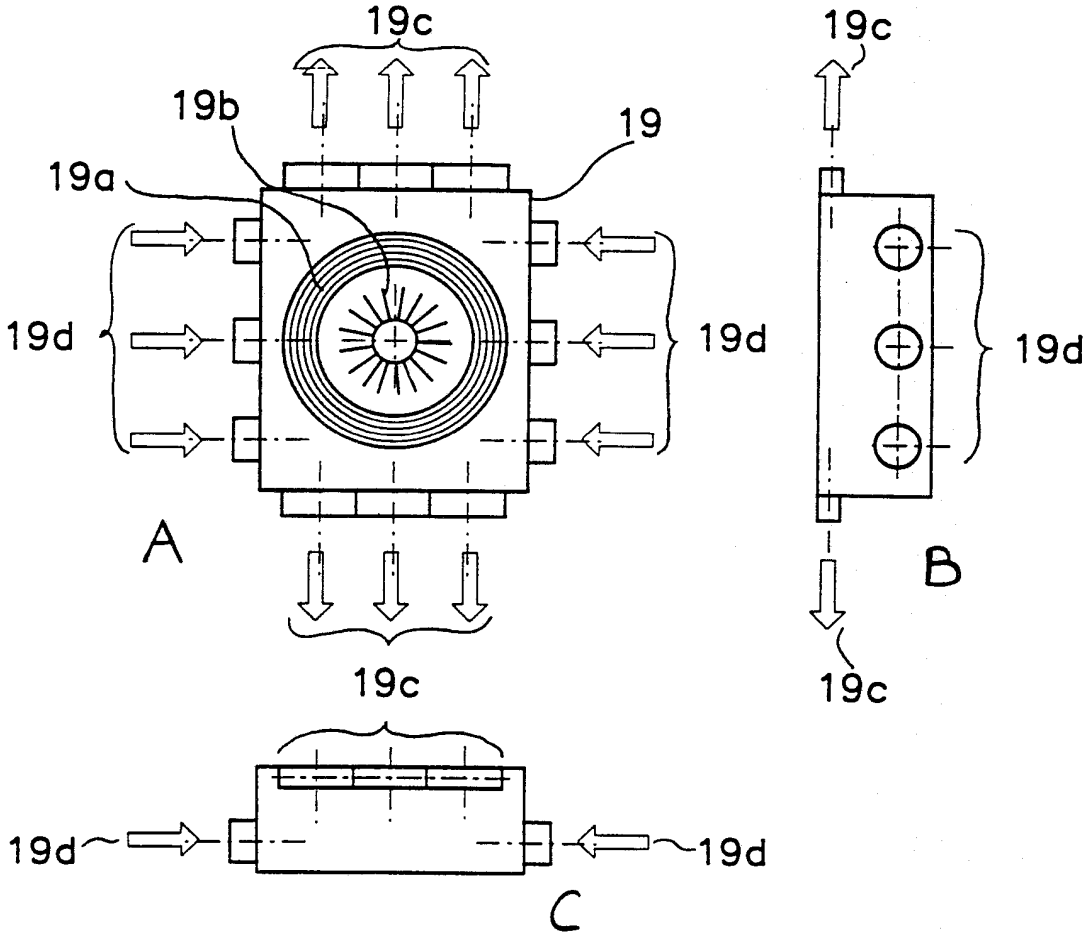

19c
19b
19
19a
19d
19d
A
19c
19d
B
19c
19c
19d
19d
C

FIG 4

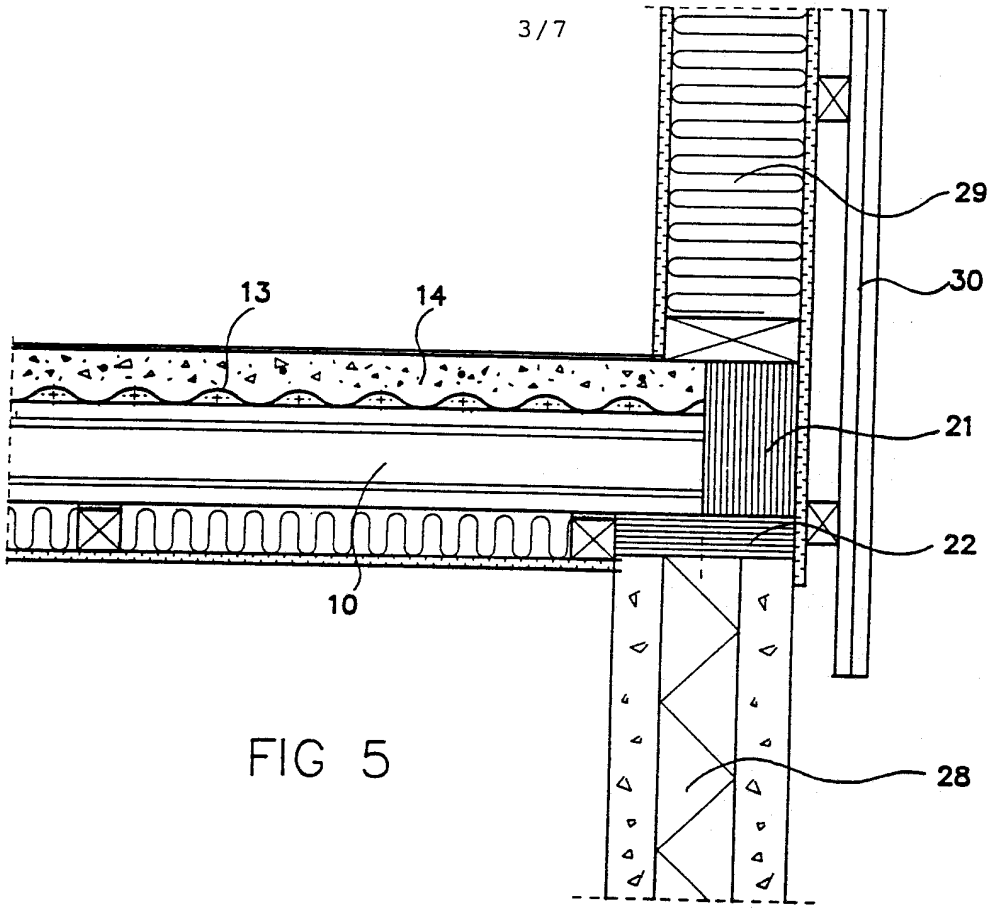

29
30
13
14
21
22
10
28

FIG 5

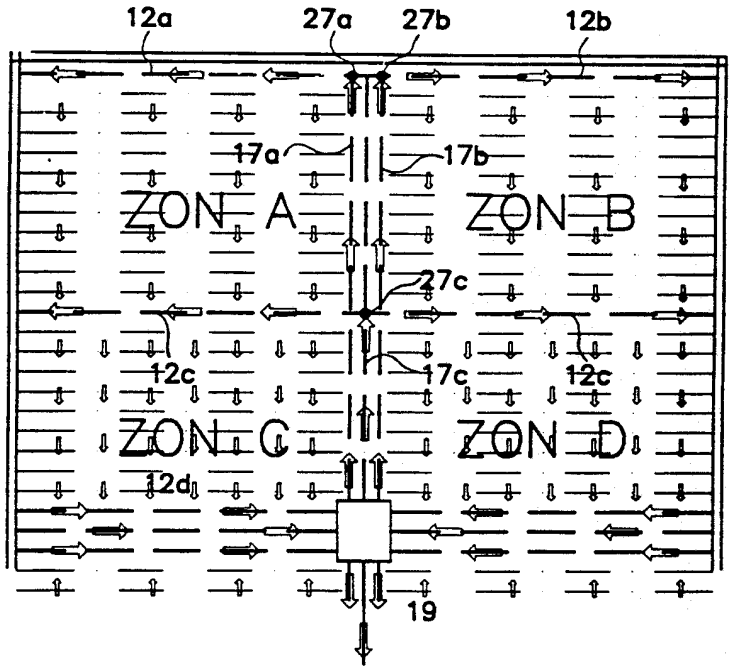

12a
27a
27b
12b
17a
17b
ZON A
ZON B
27c
12c
17c
12c
ZON C
ZON D
12d
19

FIG 6

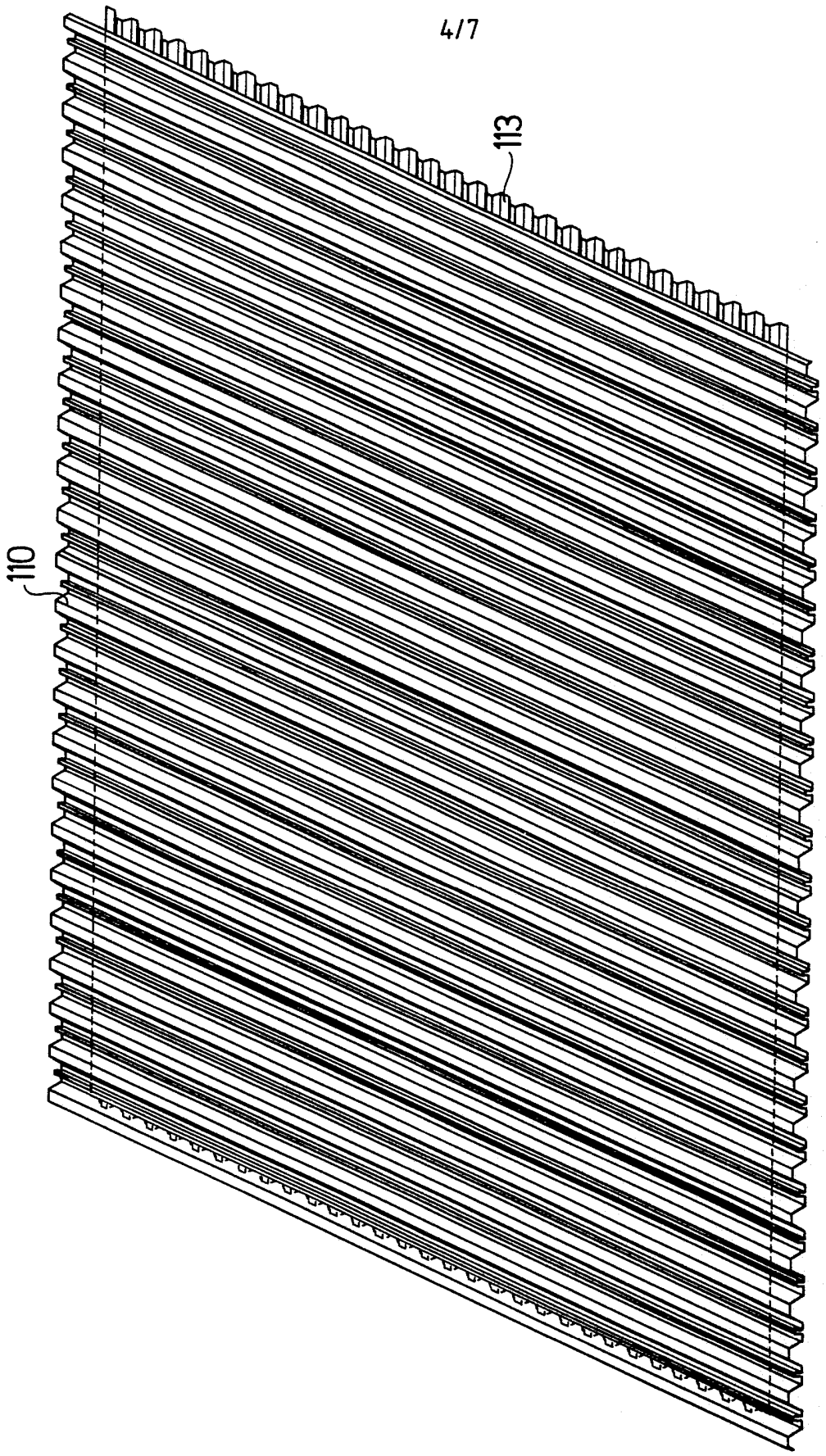


FIG. 7

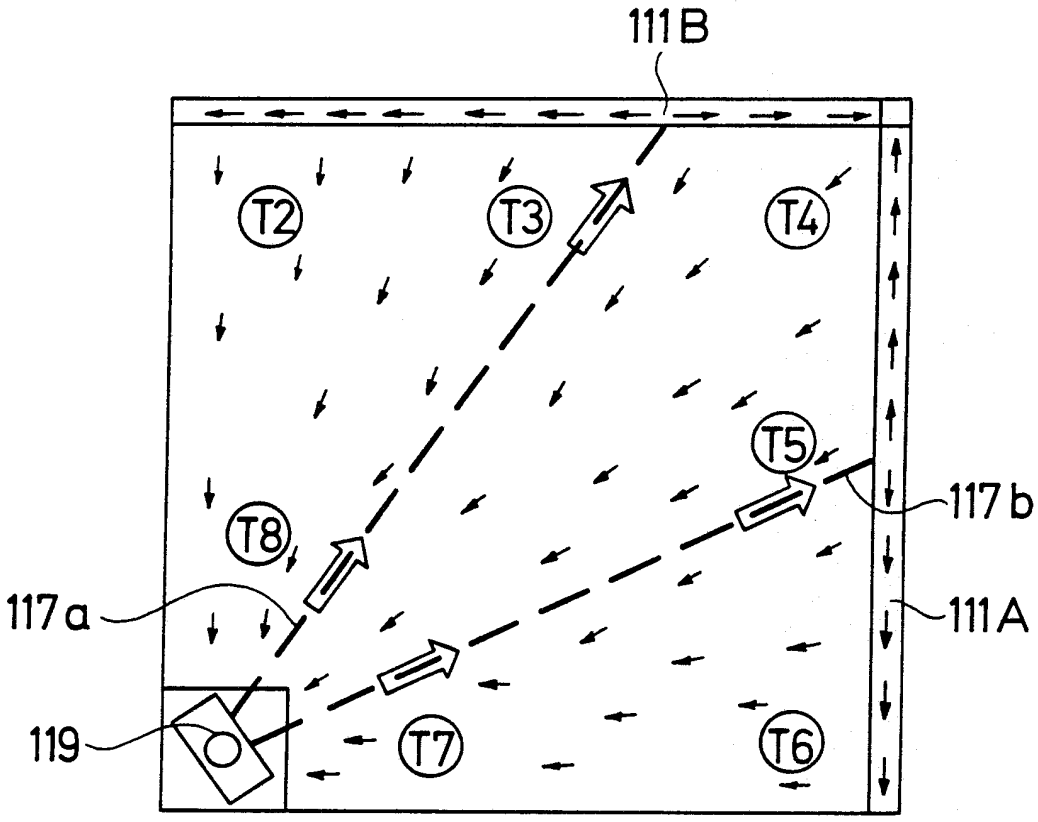


FIG. 8

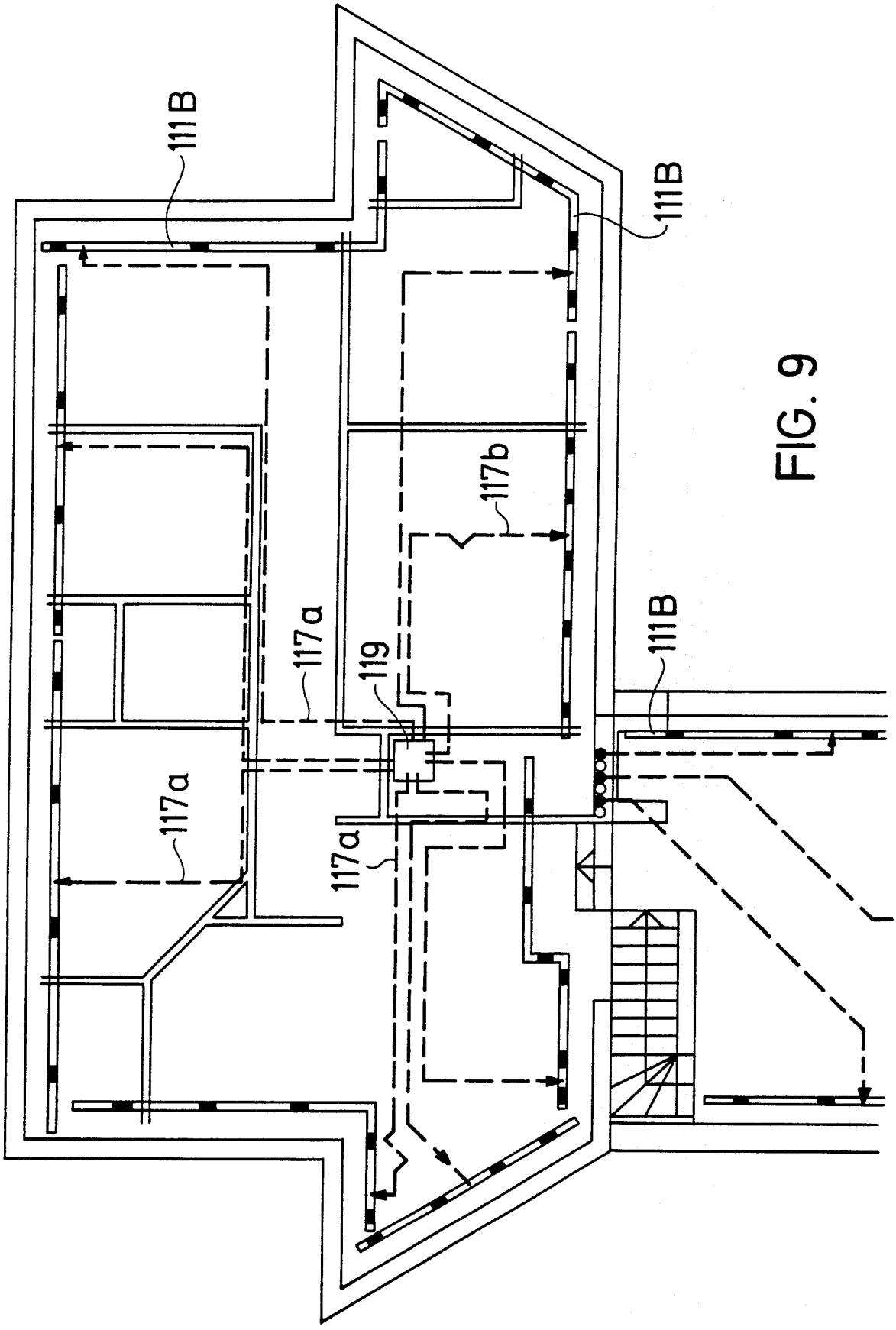


FIG. 9

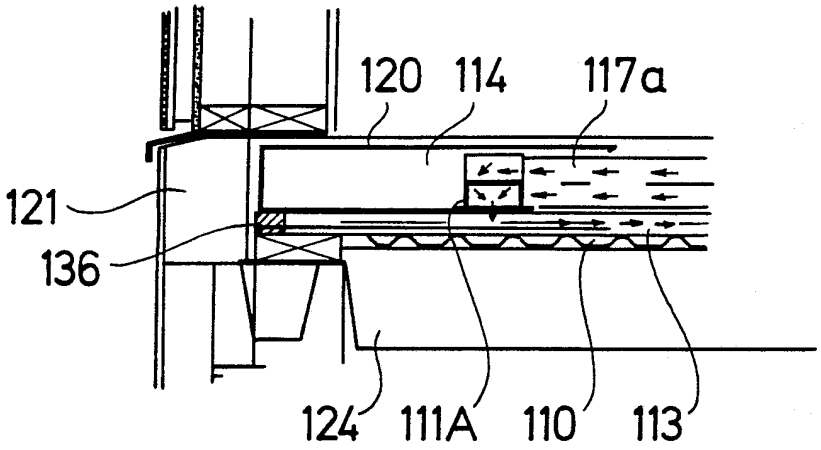

120
114
117a
121
136
124
111A
110
113

FIG. 10

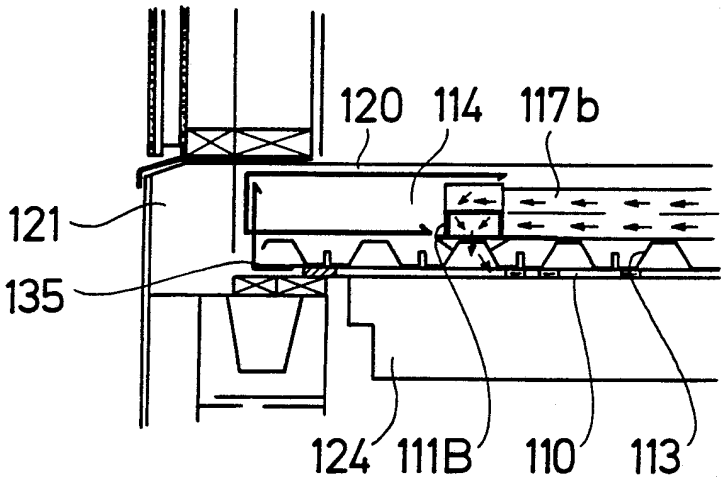

120
114
117b
121
135
124
111B
110
113

FIG. 11

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 90/00726

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: E 04 C 2/32, E 04 B 5/48, F 24 D 5/10

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	E 04 B; E 04 C; F 24 D

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	FR, A1, 2276437 (MERA-ZSM ZAKLADY SYSTEMOW MINIKOMPUTEROWYCH IM. JANKA KRASICKIEGO) 23 January 1976, see figures 1,2 --	1,2
X	SE, -, 213223 (WAGGONFABRIK AG) 30 May 1967, see the whole document --	1,2
X	CH, A, 213712 (ARDOR ENERGINEERING CO. LTD.) 3 June 1941, see figure 3 --	1,2
A	US, A, 3950910 (POBANZ) 20 April 1976, see the whole document --	1,2
X	NO, C, 60262 (H. BEHRINGER) 9 January 1939, see the whole document --	1,3

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
26th February 1991	1991 -02- 28
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Örjan Nylund

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 3331169 (E.P. CUMMING ET AL) 18 July 1967, see the whole document --	4,5
A	US, A, 4777773 (FRY) 18 October 1988, see the whole document --	3
A	EP, A2, 0254286 (GROLL, H.) 27 January 1988, see the whole document --	4-8
A	EP, A2, 0255039 (SCHMIDT REUTER INGENIEURGESELLSCHAFT MBH & CO. KG) 3 February 1988, see the whole document --	4-8

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 90/00726

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 91-01-31
The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
FR-A1- 2276437	76-01-23	NL-A-	7507152	75-12-30
SE--- 213223	67-05-30	NONE		
CH-A- 213712	41-06-03	FR-A-	845235	00-00-00
		GB-A-	482747	00-00-00
		NL-C-	48604	00-00-00
US-A- 3950910	76-04-20	NONE		
NO-C- 60262	39-01-09	GB-A-	479840	00-00-00
		GB-A-	483076	00-00-00
US-A- 3331169	67-07-18	NONE		
US-A- 4777773	88-10-18	NONE		
EP-A2- 0254286	88-01-27	DE-A-	3624987	88-02-04
EP-A2- 0255039	88-02-03	DE-C-	3625851	88-01-21